Trend Study 22-1-03

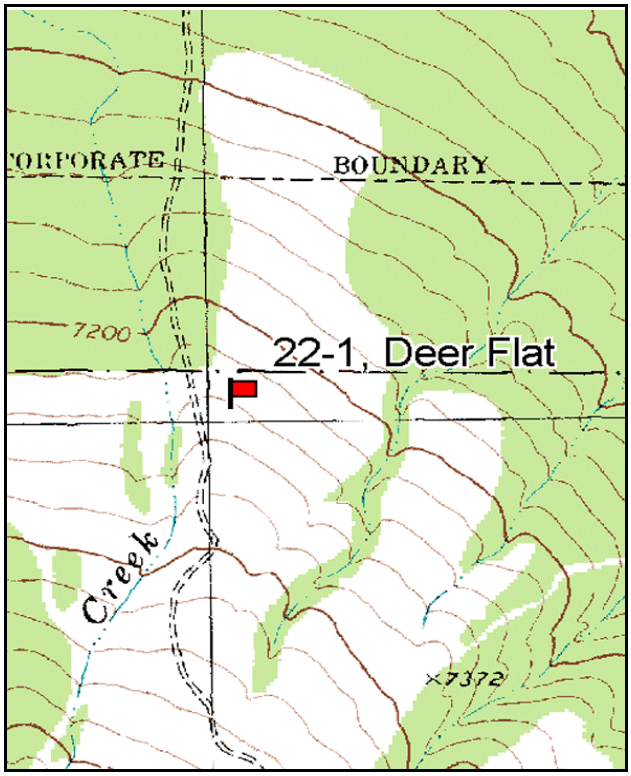
Study site name: Deer Flat . Vegetation type: Chained, Seeded P-J .

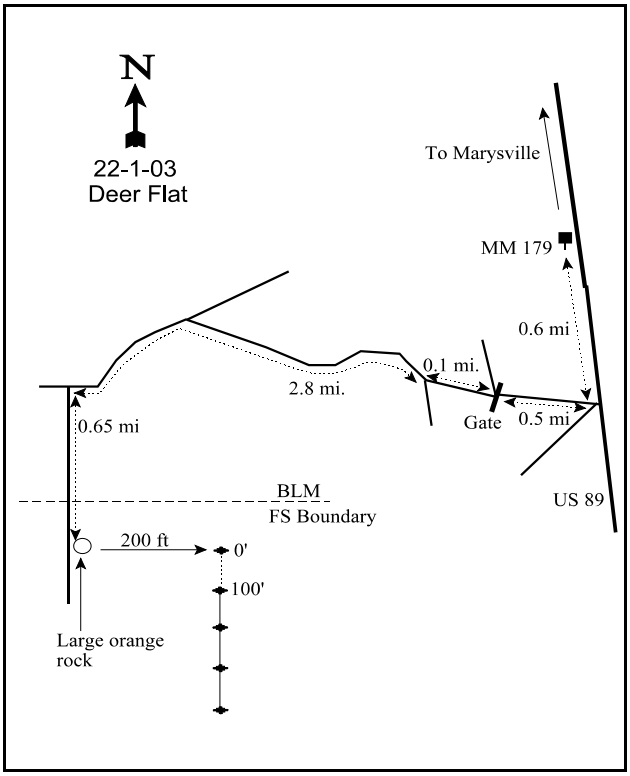
Compass bearing: frequency baseline 170 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 1 on 1ft, belt 2 on 2ft, belt 3 on 1ft, belt 4 on 5ft, belt 5 on 4ft.

LOCATION DESCRIPTION

From mile marker 179 south of Marysvale, proceed 0.6 miles and turn right on a dirt road. The road forks immediately beyond a fence, stay to the right. Proceed 0.5 miles to another fork in the road at a fence corner. Go straight through the gate, passing a road on each side. Continue 0.1 miles and turn right. Proceed 2.8 miles up this road, following a ditch, passing 2 ponds and passing through a DWR fence to another fork. Turn left. Go 0.65 miles (through a gate) to a large painted rock on the left side of the road. The 0-foot baseline stake is 200 feet east of the rock. It is a rebar with a browse tag #7106 attached.





Map Name: Mount Brigham

Diagrammatic Sketch

Township 27S , Range 4W , Section 35

GPS: NAD 27, UTM 12S 4252025 N, 388050 E

DISCUSSION

Deer Flat - Trend Study No. 22-1

This study is located on BLM administered land southwest of Marysvale. The area is considered an important deer wintering area. The area was chained and seeded to perennial grasses in 1968. The study site slopes moderately (15%) to the north at an elevation of 7,200 feet. Water is available in Pine Creek which is located about ½ mile to the north. There is another chaining and seeding project that was completed in 1981 across the Forest Service-BLM boundary about 200 feet north of this study. Pellet group transect data collected in 1998 estimated 58 deer days use/acre (143 ddu/ha), 12 elk days use/acre (30 edu/ha), and 11 cow days use/acre (27 cdu/ha). In 2003, pellet group transect data indicated increased use of the site by deer and elk at an estimated 149 deer days use/acre (369 ddu/ha) and 39 elk days use/acre (96 edu/ha). Cattle use remained low in at an estimated 8 days use/acre (20 cdu/ha). Deer and elk pellet groups indicated both winter and spring use in 2003.

Soil analysis indicates a sandy clay loam texture which appears to have good permeability and water holding capacity. Parent material appears to be sandstone and limestone, and soils are slightly acidic (pH of 6.2). The soil profile is rocky throughout and soils are fairly shallow with an effective rooting depth of less than 9 inches. Average soil temperature was moderate in both 1998 and 2003 at less than 60°F. Soils directly on the site show minimal erosion, although the road to the site crosses a small creek and the water washes down the road causing severe cutting. Soils were rated stable from an erosion condition class assessment completed on site in 2003.

The browse component at Deer Flat is diverse and abundant. Mountain big sagebrush is the key species, with black sagebrush being of secondary importance. A portion of the sagebrush on this site is likely a hybrid between the two species, and project personnel classified sagebrush by color, growth form, leaf size, and seed-head formation in 2003. Mountain big sagebrush has a fairly stable population with an estimated 3,640 plants/acre in 1998 and 3,480 in 2003. This is a much lower estimate compared to the 1985 and 1991 surveys, but this is because of the much larger sample size used after 1992. This larger sample size gives more accurate density estimates for browse populations. Young plants made up a large proportion of the population in both 1985 and 1991 (54% and 47% respectively), but have steadily declined in 1998 (13%) and 2003 (1%). The decline in young plants may also be due in part to the larger sampling scheme used in 1998 and 2003. Use on mountain big sagebrush has been moderate to heavy in all readings, but vigor has been generally normal. Decadence was fairly low between 1985 and 1998, but increased to 45% in 2003. Annual sagebrush leaders averaged almost three inches of growth by June 2003. Black sagebrush density was estimated at 3,920 plants/acre in 1998 and 3,520 in 2003. Use on black sagebrush has been lighter compared to mountain big sagebrush in most years. Vigor has generally been good. As with mountain big sagebrush, percent decadence in black sagebrush increased in 2003 to 50%. Recruitment by young black sagebrush plants mimics that of mountain big sagebrush at 13% in 1998 and 1% in 2003.

Other browse sampled on the site include both curlleaf and true mountain mahogany, slenderbush eriogonum, dwarf rabbitbrush, Parry rabbitbrush, and Gambel oak. The mahogany species consist of mature plants that are very short due to heavy browsing each year. In 2003, both dwarf and Parry rabbitbrush were noted as being heavily browsed. Parry rabbitbrush had been hedged nearly to the ground on many plants, but had abundant long leaders of growth up to 14 inches in length. Gambel oak has slowly but steadily increased with each reading and had an estimated density of 1,040 stems/acre in 2003. Oak displayed moderate to heavy use in 2003, with no decadent plants being sampled. Less desirable species include broom snakeweed, pricklypear cactus, stickyleaf low rabbitbrush, and gray horsebrush. These species all occur in very low densities. In the absence of some type of disturbance, these species do not appear to be a threat to increase in the near future. In 2003, pinyon and juniper had estimated densities of 55 and 22 trees/acre respectively. Although tree density remains relatively low, photographs show a noticeable increase in the size of the trees

across the site.

The herbaceous understory is highly diverse, but production is only moderate. Crested wheatgrass is the most abundant grass on the site and has maintained a fairly stable frequency over all years. Crested wheatgrass provided 35% of the grass cover in 1998 and 48% in 2003. Other fairly abundant grasses include smooth brome, mutton bluegrass, and bottlebrush squirreltail. These grasses are desirable species that add variety to the diets of game animals and livestock. A total of 11 perennial grass species were sampled on the site in 2003 with crested wheatgrass and smooth brome showing light to moderate use. Cheatgrass was sampled in both 1998 and 2003. However, it is in low abundance due to the highly competitive perennial grass component. Although diverse, forbs offer little cover or forage. Longleaf phlox and redroot eriogonum are the most common perennial species. Annual stickseed had the highest nested frequency value of all the forb species in 2003. Forbs are an important source of deer forage during early spring green-up when energy demands for recovery from winter survival, fetal development and antler growth are high. An increase in perennial forbs would greatly add to the usefulness of this site for wildlife.

1985 APPARENT TREND ASSESSMENT

Erosion was not detected and the soil appears stable to improving. Seventeen years after the chaining, the vegetative community appears healthy with high diversity and a good mixture of grasses, forbs and shrubs. The community appears stable, although age composition indicates that the shrub component may expand somewhat.

1991 TREND ASSESSMENT

Here again is the repetitious theme, the extended drought has apparently aggravated the situation with increases in percent bare ground, decreasing litter cover, thus exposing the soil to the harmful effects of high intensity summer storms. The soil trend is slightly downward. Most of the key shrubs (black sagebrush, mountain big sagebrush, curlleaf mountain mahogany) have experienced some kind of increases in their respective densities. Mountain mahogany was the only key browse species that experienced a noticeable decrease in it's density. Rates of decadency have increased for all key browse species regardless of the direction of their respective population changes. Another important characteristic to monitor is the proportion of the plants that are considered to be in poor vigor. This trend should turn around with better precipitation patterns in coming years and an end to the extended drought. The browse trend is slightly up. Most of the herbaceous understory species are also experiencing increased values for nested and quadrat frequency. The herbaceous understory trend is slightly upward.

TREND ASSESSMENT
soil - slightly down (2)
browse - slightly up (4)
herbaceous understory - slightly up (4)

1998 TREND ASSESSMENT

Vegetation and litter cover are abundant on this site and there is little sign of current erosion. The soil trend is stable. With the exception of black sagebrush, the browse populations show a decrease in density. This decrease is due to the much larger sample size now used to estimate density. Mountain big sagebrush age structure indicates a maturing population that is currently healthy. The black sagebrush population is also healthy, although more seedling plants for each population would be beneficial. The browse trend is stable. The herbaceous understory trend is slightly downward due a decrease in sum of nested frequency for perennial species. Grasses dominate the herbaceous understory and account for most of the nested frequency decline.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - slightly down (2)

2003 TREND ASSESSMENT

Trend for soil is stable. Protective ground cover from vegetation and litter remains adequate to help limit erosion. Percent bare soil remains at about the same level as in 1998. Trend for browse is down slightly. The key species, mountain big sagebrush and black sagebrush show slight declines in density, but higher decadence and very low recruitment rates in 2003. More preferred yet less abundant species such as curlleaf and true mountain mahogany display heavy browsing and no reproduction. The current drought period is likely the main factor driving these downward trends for browse populations. The herbaceous understory trend is slightly down due to the decrease in sum of nested frequency for perennial grasses and forbs. The most abundant perennial grass, crested wheatgrass, remained stable in 2003. The second most abundant grass, mutton bluegrass, declined in frequency but not significantly. Grass production declined by nearly one-half as average cover of perennial grasses was 7% in 2003. Forbs are diverse but provide very little forage or cover. Sum of nested frequency for forbs slightly decreased in 2003.

TREND ASSESSMENT
soil - stable (3)
browse - slightly down (2)
herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 1

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	75	104	107	114	5.05	3.38
G	Agropyron spicatum	4	10	14	3	.42	.04
G	Bouteloua gracilis	$_{ab}$14	$_{b}$39	$_{a}$10	$_{ab}$12	.07	.20
G	Bromus inermis	27	45	41	48	1.92	1.52
G	Bromus tectorum (a)	-	-	$_{b}$37	$_{a}$15	.56	.06
G	Carex spp.	$_{ab}$12	$_{ab}$14	$_{b}$20	$_{a}$1	.14	.00
G	Koeleria cristata	$_{b}$59	$_{b}$43	$_{b}$60	$_{a}$9	1.04	.05
G	Oryzopsis hymenoides	-	5	-	3	-	.03
G	Poa fendleriana	$_{c}$255	$_{b}$195	$_{a}$107	$_{a}$65	3.30	.93
G	Poa secunda	-	-	$_{b}$45	$_{a}$3	1.68	.03
G	Sitanion hystrix	$_{a}$40	$_{b}$65	$_{a}$21	$_{a}$37	.20	.62
G	Stipa comata	$_{a}$9	$_{b}$49	$_{a}$7	$_{a}$9	.19	.11
Total for Annual Grasses		0	0	37	15	0.56	0.06
Total for Perennial Grasses		495	569	432	304	14.05	6.94
Total for Grasses		495	569	469	319	14.61	7.00

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Agoseris glauca	$_{a}$-	$_{b}$9	$_{ab}$6	$_{ab}$3	.04	.01
F	Alyssum alyssoides (a)	-	-	-	2	-	.00
F	Antennaria rosea	-	2	3	-	.03	-
F	Arabis demissa	3	-	1	-	.03	-
F	Astragalus spp.	$_{b}$11	$_{ab}$5	$_{b}$9	$_{a}$-	.08	-
F	Astragalus utahensis	-	-	2	1	.00	.00
F	Castilleja chromosa	$_{a}$-	$_{b}$11	$_{ab}$1	$_{a}$-	.00	-
F	Camelina microcarpa (a)	-	-	1	-	.00	-
F	Calochortus nuttallii	$_{bc}$14	$_{c}$18	$_{a}$-	$_{ab}$8	-	.01
F	Collinsia parviflora (a)	-	-	-	6	-	.01
F	Descurainia pinnata (a)	-	-	-	8	-	.04
F	Erigeron pumilus	-	3	6	4	.06	.03
F	Eriogonum racemosum	23	26	31	26	.25	.39
F	Eriogonum umbellatum	-	-	-	3	-	.03
F	Lappula occidentalis (a)	-	-	$_{a}$-	$_{b}$100	-	.92
F	Lesquerella intermedia	-	-	1	3	.00	.03
F	Lithospermum ruderale	2	1	3	2	.30	.15
F	Lomatium spp.	-	3	-	7	.00	.01
F	Machaeranthera canescens	-	-	-	-	.01	-
F	Microsteris gracilis (a)	-	-	2	11	.00	.02
F	Orobanche fasciculata	-	-	7	-	.04	-
F	Petradoria pumila	14	12	15	9	.66	.10
F	Phlox longifolia	$_{ab}$41	$_{b}$58	$_{b}$55	$_{a}$26	.23	.13
F	Polygonum douglasii (a)	-	-	$_{b}$15	$_{a}$6	.04	.01
F	Sphaeralcea coccinea	7	7	3	-	.03	-
F	Tragopogon dubius	4	-	-	-	-	-
F	Trifolium spp.	$_{ab}$28	$_{b}$31	$_{a}$12	$_{a}$10	.03	.05
F	Unknown forb-perennial	2	-	-	-	-	-
Total for Annual Forbs		0	0	18	133	0.05	1.02
Total for Perennial Forbs		149	186	155	102	1.82	0.96
Total for Forbs		149	186	173	235	1.87	1.99

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 22 , Study no: 1

Type	Species	Strip Frequency '98	Strip Frequency '03	Average Cover % '98	Average Cover % '03
B	Artemisia nova	53	48	8.77	6.34
B	Artemisia tridentata vaseyana	83	79	18.67	15.26
B	Cercocarpus ledifolius	5	2	.06	-
B	Cercocarpus montanus	18	21	.38	.33
B	Chrysothamnus depressus	5	8	.01	.03
B	Chrysothamnus parryi	0	2	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	1	0	-	-
B	Eriogonum microthecum	14	18	.73	.23
B	Gutierrezia sarothrae	1	2	.03	.15
B	Juniperus osteosperma	0	1	-	1.25
B	Opuntia spp.	26	23	.41	.43
B	Pediocactus simpsonii	0	3	-	-
B	Pinus edulis	5	3	2.64	2.34
B	Purshia tridentata	0	0	.00	-
B	Quercus gambelii	9	9	1.80	1.08
B	Sclerocactus	2	0	.01	-
B	Tetradymia canescens	0	2	-	.00
Total for Browse		222	221	33.52	27.48

CANOPY COVER, LINE INTERCEPT --
Management unit 22 , Study no: 1

Species	Percent Cover '03
Artemisia nova	6.40
Artemisia tridentata vaseyana	12.98
Cercocarpus montanus	.51
Chrysothamnus depressus	.06
Eriogonum microthecum	.26
Juniperus osteosperma	2.40
Opuntia spp.	.45
Pinus edulis	4.43
Quercus gambelii	6.71

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 22 , Study no: 1

Species	Average leader growth (in) '03
Artemisia tridentata vaseyana	2.7
Cercocarpus montanus	3.7
Cercocarpus ledifolius	3.2

POINT-QUARTER TREE DATA --
Management unit 22 , Study no: 1

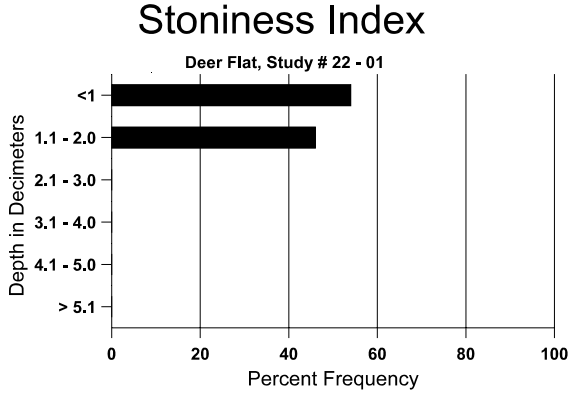
Species	Trees per Acre '98	Trees per Acre '03	Average diameter (in) '98	Average diameter (in) '03
Juniperus osteosperma	13	22	3.8	4.7
Pinus edulis	39	55	4.2	4.3

BASIC COVER --
Management unit 22 , Study no: 1

Cover Type	Average Cover % '85	'91	'98	'03
Vegetation	9.50	11.00	42.20	36.33
Rock	9.50	11.75	15.98	17.59
Pavement	8.00	3.50	9.25	5.68
Litter	60.00	53.50	50.24	40.18
Cryptogams	0	.25	.58	.18
Bare Ground	13.00	20.00	12.41	14.11

SOIL ANALYSIS DATA --
Management unit 22, Study no: 1, Study Name: Deer Flat

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
8.7	59.0 (7.7)	6.2	52.0	27.4	20.6	6.5	12.1	233.6	1.0



PELLET GROUP DATA --
Management unit 22 , Study no: 1

Type	Quadrat Frequency	
	'98	'03
Rabbit	37	13
Elk	5	8
Deer	55	31
Cattle	7	2

Days use per acre (ha)	
'98	'03
-	-
12 (30)	39 (96)
58 (143)	149 (369)
11 (27)	8 (20)

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 1

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia nova											
85	**1999**	466	1266	600	133	-	30	0	7	3	13/20
91	**3265**	-	1066	1666	533	-	22	49	16	6	10/17
98	**3920**	20	500	2800	620	140	17	1	16	2	15/23
03	**3520**	-	20	1740	1760	220	7	3	50	4	16/20
Artemisia tridentata vaseyana											
85	**9333**	1200	5000	3933	400	-	44	2	4	.71	23/29
91	**9599**	-	4533	3000	2066	-	35	31	22	6	24/28
98	**3640**	-	480	2480	680	140	39	6	19	1	22/32
03	**3480**	-	20	1900	1560	380	32	52	45	9	25/29
Cercocarpus ledifolius											
85	**66**	-	66	-	-	-	0	0	-	0	-/-
91	**133**	-	133	-	-	-	50	50	-	0	-/-
98	**120**	-	100	20	-	-	0	0	-	0	16/16
03	**40**	-	-	40	-	-	0	100	-	0	11/13
Cercocarpus montanus											
85	**1399**	933	1266	133	-	-	19	71	0	0	15/13
91	**932**	133	266	466	200	-	0	86	21	7	9/11
98	**380**	60	260	120	-	20	32	5	0	0	18/18
03	**480**	-	-	480	-	-	8	75	0	0	14/14
Chrysothamnus depressus											
85	**133**	-	-	133	-	-	0	0	0	0	2/5
91	**0**	-	-	-	-	-	0	0	0	0	-/-
98	**120**	-	60	60	-	-	17	0	0	0	2/8
03	**280**	-	-	260	20	-	14	86	7	0	6/8

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus parryi											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**40**	-	-	40	-	-	0	0	-	0	13/18
Chrysothamnus viscidiflorus viscidiflorus											
85	**66**	-	-	66	-	-	0	0	0	0	4/9
91	**66**	-	-	-	66	-	0	100	100	0	-/-
98	**20**	-	-	20	-	-	0	0	0	0	11/13
03	**0**	-	-	-	-	-	0	0	0	0	-/-
Eriogonum microthecum											
85	**1399**	-	533	866	-	-	5	10	0	0	5/7
91	**2199**	-	333	1733	133	-	15	21	6	3	6/6
98	**400**	-	20	360	20	-	10	0	5	5	6/12
03	**680**	-	40	640	-	-	24	35	0	0	5/6
Gutierrezia sarothrae											
85	**1799**	-	333	1466	-	-	0	0	0	0	7/5
91	**399**	-	-	333	66	-	0	0	17	0	8/8
98	**20**	-	-	20	-	-	0	0	0	0	7/5
03	**40**	-	20	20	-	-	0	0	0	0	6/6
Juniperus osteosperma											
85	**66**	-	-	66	-	-	0	0	-	0	44/33
91	**66**	-	-	66	-	-	0	0	-	0	63/67
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**20**	-	-	20	-	-	0	0	-	0	-/-
Opuntia spp.											
85	**2932**	-	666	2066	200	-	0	7	7	18	4/6
91	**2466**	200	1333	1000	133	-	0	14	5	0	5/11
98	**720**	40	180	500	40	-	0	0	6	6	5/10
03	**820**	-	-	700	120	-	0	7	15	5	5/10
Pediocactus simpsonii											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**40**	-	-	-	-	-	0	0	-	0	-/-
03	**100**	-	40	60	-	-	0	0	-	0	2/4

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Pinus edulis											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**66**	-	66	-	-	-	0	0	-	0	-/-
98	**100**	-	-	100	-	20	0	0	-	0	-/-
03	**60**	-	-	60	-	-	0	0	-	0	-/-
Quercus gambelii											
85	**66**	200	66	-	-	-	100	0	0	0	-/-
91	**133**	-	133	-	-	-	50	50	0	0	-/-
98	**540**	-	100	420	20	40	7	26	4	4	31/28
03	**1040**	-	200	840	-	20	63	17	0	0	19/16
Sclerocactus											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**66**	-	66	-	-	-	0	0	-	0	-/-
98	**40**	20	20	20	-	-	0	0	-	0	2/3
03	**0**	-	-	-	-	-	0	0	-	0	-/-
Tetradymia canescens											
85	**66**	-	-	66	-	-	0	0	-	0	4/6
91	**133**	-	-	133	-	-	0	0	-	0	6/7
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**40**	-	20	20	-	-	0	0	-	0	6/10